Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

nature, carried on with such freedom and boldness, and leading in so many instances to results, different from the common belief, will unavoidably be liable to some doubts and objections.

We are fully sensible that our efforts must fail of giving an adequate impression of the merit of this great work, which we think unlikely ever to be surpassed in its own department, and we can hardly hope that any historian will arise to finish the vast fabric of Roman history, according to the magnificent plan of Niebuhr, and in a style to correspond with the foundation he has laid.

Art. V.—*Professor Hitchcock's Report on the Geology, &c. of Massachusetts.*

1. *Report on the Geology, Mineralogy, Botany, and Zoology of Massachusetts, made and published by order of the Government of that State. With a Descriptive List of the Specimens of Rocks and Minerals collected for the Government. Illustrated by numerous Wood Cuts, and an Atlas of Plates.* By Edward Hitchcock, A. M., Professor of Chemistry and Natural History in Amherst College, &c. Second Edition, corrected and enlarged. Amherst, 1835. 8vo. pp. 702.

Geology has for its object the natural history of the earth. It is regarded by Professor Mohl as a department of Physical Astronomy. Its name is derived from the Greek γῆ, earth, and λόγος, a discourse; and is understood to signify the doctrine or science of the earth. This science investigates and describes the structure of our globe, the nature of its various components, and the laws which have effected, and still continue to produce, changes in its mass. It not only explains those things which are interesting to a philosopher, but also aims to be practically useful. Descending with the miner into the darkest subterranean recesses, it directs, by its light, his operations to their most successful results. The situations in which are found the valuable metallic ores, beds of coal, gypsum, rock salt, strata of limestone, marble, and a thousand other materials useful to man, are pointed out with a great degree of accuracy, and are all described as they occur in nature.

Soils are found to consist of the detritus of decomposed, and disintegrated rocks, mixed with variable proportions of vegetable and animal matter; and the nature of the mineral elements is known to have a great influence on their fertility, and their adaptation to the different kinds of plants, which are cultivated for the use of man. A knowledge of soils is indispensible to the geologist; and his science aids the agriculturalist in amending those which are sterile, from the presence of noxious matters, or from an undue proportion of certain mineral elements. The architect and engineer are indebted to this science for an account of the nature and situation of valuable materials used in their constructions, and for indications by which they may avoid those which have within them substances that will cause their rapid decay, or deface their beauty. Thus they are enabled to select building stones which will defy the ravages of time, and retain their original texture and color.

By the aid of geology we are directed to our great mineral resources, which constitute an important part of the solid basis of national prosperity in the useful arts. Materials required at all times, but more especially in time of war, when obstructed commerce cuts off our supplies from foreign lands, are unfolded and are ready for use the moment they shall be required. Mines of iron, copper, lead, sources from which we may obtain nitre, sulphur, and other indispensible materials for national defence, are thus pointed out, and give us a feeling of greater security and independence; for we hold to the maxim, that every country should have within itself the means of support and defence. There are memorable instances on record, of nations having been thrown on their internal resources, and having been rescued by science from destruction.

It is evident that a scientific geological examination, is the cheapest and best means of bringing to light the valuable minerals of a country. How vast an amount of property has been lost by absurd mining speculations, the abandoned pits in every part of our country can amply testify; and even now, we hear of new projects which are continually springing up, and which end, as might be anticipated by a geologist, in total failure. During the last summer, we witnessed many absurd researches for coal and metals, in places where, according to the laws of nature, they never are found. Pits were sunk at great expense, into granite mountains, for coal; and the delusion was often kept up by the discovery of a black and brilliant mass or crystal of tourmaline, which, to those ignorant of mineralogy, appeared to be an indication of coal; although to one acquainted with that science, it was a most decisive proof that no trace of that valuable combustible would be found there.

We have seen a company actively engaged in boring for coal, at great expense, in strata standing in nearly a perpendicular position. Had they understood the first principles of geology, they would have seen at a glance, that such an operation was useless; for, had the strata belonged to the coal series, which they did not, the coal would have been found at their out-cropping edges, and on the surface of the earth, and not, as they had imagined, at a great depth.

Subscription books for stock in a coal mine, proposed to be opened in the midst of primitive rocks, have been presented in many of our large cities, and more than a thousand persons have put down their names for shares, and paid a certain sum in advance, to carry on the work. A geologist could have informed them at once, that such researches were idle and must fail.

The brilliant lustre of iron pyrites has led many a worthy farmer to abandon the cultivation of his farm, and to dig deep in the earth for supposed mines of gold and silver; and companies have been formed with similar expectations, and their capital wasted in unprofitable labor, when the question respecting the value of the mineral, might have been settled in a few minutes, by a mineralogist or chemist.

Did our limits permit, we could cite thousands of similar facts, which have presented themselves to our observation, in our Mineralogical and Geological excursions, but we forbear; and should our reader feel sceptical on this subject, we advise him to set out on a similar journey, armed and equipped in character, and to converse with the people he may meet with in his travels, respecting the supposed mineral wealth of their districts. He will be sure, even if he does not collect a supply of brilliant minerals, to amass a fund of amusing and instructive anecdotes about the mineral divining rod, and mines of gold, and silver, besides hearing of an abundance of Kidd's money buried in the earth.

We have alluded, briefly and generally, to some of the practical uses of Geology; but it is evident that there are other and higher claims, possessed by this science. It opens to us the great book of nature, where we may read the eternal truths of creation, those "sermons in stones," which were written by the finger of the ALMIGHTY, and which bear indisputable proofs of his wisdom, goodness, power and omnipresence.

Whoever enters on this study with proper feelings, and pursues it with intelligence and success, can never look back, but is continually urged onward by the discovery of new and wonderful truths, which fill his mind with the most sublime emotions. The world has its history written on its strata; a history so interesting, that the most splendid fictions of the human imagination sink into insignificance when compared with it; in the same measure as all human productions must, when compared with the eternal works of the Creator. The enthusiastic zeal of every true Geologist, testifies that his pursuits are of the highest interest, and is a sure promise to the beginner, who sees but dimly into the system of the world, that knowledge will, in itself, be a sufficient reward. When we study inorganic matter in its natural state, we contemplate the materials whence all organized beings derive their corporeal substance. Plants and animals draw the elements of which they are composed, directly or indirectly from the mineral kingdom. Hence it will appear that a philosophical study of organized beings should begin with the consideration of the primitive mineral elements, and trace their several states of existence in an ascending order.

Although Geology is confessedly in its infancy, we may observe, as the celebrated Gay Lussac has remarked of Chemistry, that the science is so rich in facts that not a single individual in the world can be found, who is possessed of one tenth part of what is known. We shall therefore look in vain for a perfect Geologist. The immortal Cuvier knew but little of Mineralogy and Chemistry, while by his knowledge of comparative anatomy, applied to Geology, he unveiled the history of the world before the creation of man. It is not then to be expected, that any one Geologist will attain to perfection in every department, and there is room enough for division of labor.

A knowledge of Natural Philosophy, Mineralogy, Chemistry, Botany, and Zoology, is essential to the complete Geologist;

besides which, he should possess the power of remembering details of science, and of generalizing facts. If any man attempt to master all these branches of science, life would be too short for its accomplishment. Either a superficial knowledge of the whole may be obtained, or he may endeavor to become as nearly perfect as possible in some departments, and take a more partial glance at the others, and he may then call in the aid of those who have mastered particular branches, to assist him when he is undecided. Division of labor is then called for, and this will be the natural result of enlarging the domain of science. Inorganic matter presents itself in three different states; solid, liquid, and gaseous. The first has received the principal share of the Geologist's attention, while the two latter have chiefly been considered by him on account of their influence on the former. They all properly belong to Geology, and should be described in a complete system. The solid matter of the globe has been variously divided by Geologists, according to their individual views of the subject. Some have sought to find out natural divisions, others have formed a more artificial arrangement. The division into stratified and unstratified rocks, seems to satisfy, in some degree, those who seek for a natural method. Others have paid less regard to this system, and have endeavored to classify rocks according to their relative age, as proved by their relative position, and the fossils they contain. The first class of rocks, acknowledged by all Geologists, is the primary or primitive formation, in which no organic remains are ever found; such as granite, gneiss, sienite, &c. The next series of rocks, called the transition formation, is still a subject of discussion; some considering it a distinct formation, others maintaining that it cannot be divided from the secondary series. The fossil trilobite is considered as its distinguishing mark. The secondary rocks lie above those called transition, and contain numerous fossil shells and plants. The tertiary comes still higher in the arrangement, and is characterized by containing many shells analogous to existing genera and species, lignites, and numerous fossil bones of fishes, reptiles, and quadrupeds.

The diluvial formation consists of water-worn stones, sand and clay confusedly mixed together, and bearing evident marks of having been subject to the action of powerful currents of water.

The alluvium is a formation continually produced by the action of water on hills and mountains, the detritus being washed down into the plains and valleys, and deposited at the sides and mouths of rivers. Volcanic rocks are thrown out in the form of streams of lava, scoriæ and volcanic sand, and cover a comparatively limited area of country. It will be understood by our reader that we have enumerated the rock formations in an ascending order, beginning with the lowest that have ever been discovered.

Most of the stratified rocks appear to have been deposited from water, and to have subsequently become indurated; while the unstratified rocks generally bear indisputable marks of igneous fusion, and have mostly been protruded from below through the overlying strata, effecting remarkable changes in the rocks through which they were injected. Those Geologists who deny the existence of the transition formation, account for the difference between those rocks and the secondary, by supposing them to have been powerfully heated by the protrusion of the primary rocks in an incandescent state against and through them, which gave the strata a more crystalline aspect and greater induration. In case this class should be dispensed with, the formation will be designated as the older secondary series, which, for the sake of the numerical nomenclature, is upon the whole desirable. Some Geologists study rock formations in an ascending order, beginning with the lowest known, and describing the different strata as they lie one above the other. This is also the most simple and easy method of teaching the science, for the upper rocks are chiefly composed of the fragments and fine particles of those beneath them. The lowest rocks are destitute of fossil remains of organized beings, and they are therefore less complicated, and more easily studied. The organic relics continually increase in number as we ascend, and become more and more complex in their structure; so that the student is gradually advanced in the study according to the order of creation, until he comes to the recent epoch when man appeared upon earth. Others have thought the descending order a more natural method, and beginning with the alluvial soil, penetrate downwards, until they reach the lowest known rocks.

This is the order pursued by the author of the Report before us; and although we do not think it the most easy and natural method, we are still willing to concede to him his point of view, and are ready to admire the marvels of nature which he is able from thence to descry. It may be advantageous to take our observations from different points, as more confidence can be placed in their results, if they should be found to coincide.

An eminent French Geologist has observed, that if there were any country where a general system of geology could be constructed, it was America, where the great extent and prominent features of her mountain ranges are best calculated to display the structure of the globe.

To Massachusetts belongs the honor of having made the first complete geological survey of a whole state, under the authority of government; the surveys of this nature in Europe having been made by individual exertion, and seldom or partially accomplished by the aid of government. It is highly creditable to our state that such a survey should be called for by the voice of the people, as it proves that a greater degree of liberality, intelligence and science is diffused among the people than can be found in any a similar class in any state of Europe. We are rejoiced to perceive that many other states of our confederacy are following the example of Massachusetts. Tennessee has been, in part, carefully examined by Dr. Gerard Troost; Maryland is undergoing a thorough exploration by Messrs. Ducatel and Alexander; Virginia, Ohio, Pennsylvania, New-Jersey, New-York, Connecticut and Maine, are taking measures to effect a similar object. The Carolinas have been only partially explored, and in reference wholly to their gold mines. The government of the United States has employed a Geologist to survey the unexplored public lands, and a report has been published respecting the Geology of the Arkansas, which, we regret to say, does not give much satisfactory information respecting the districts which it proposes to describe.

Should each and every state in the Union be examined by competent Geologists, the greatest advantages will necessarily accrue to science, the arts and commerce. Those mineral riches that are wanting in one state will be discovered in another, and a mutual and beneficial dependence will render their union still more indissoluble.

The Geological survey of Massachusetts was undertaken by Professor Hitchcock, under the direction of the state government, as authorized by an act of the Legislature, passed the 5th June, 1830, and on the 2d of February, 1831 a resolve was voted to authorize the surveyor to add to his work a list of the Mineralogical, Botanical and Zoological productions of the commonwealth. In 1833 the first edition of the work was published, with an appropriate geological map, wood cuts, plates, catalogues of specimens, and lists of native plants, and animals. Copies of this work were presented to the members of the legislature, and to all the scientific and literary institutions of the state. The first edition being soon exhausted, a second and much improved one was published in 1835, which was disposed of in a similar manner by government. This edition is, in many respects, superior to the first, as many additions were made to it, and extensive and corrected catalogues were substituted for the old and imperfect ones in the former edition. The collections of rocks and minerals made to illustrate the Geology of the state were fifteen hundred and fifty specimens for the government, and nine hundred for each of the three colleges of the state. The government collection has been deposited, by state authority, in the cabinet of the Boston Society of Natural History, where they have been arranged, and can always be examined by the members of the government, and are open to public view every Wednesday.

The Report is divided into four parts viz.: Economical Geology, Topographical Geology, Scientific Geology, Catalogues of Botanical and Zoological productions, and lists of specimens. Under the head of Economical Geology, Professor Hitchcock describes the rocks, soils and minerals that may be applied to useful purposes, and thus become sources of pecuniary profit. First, as relates to Agriculture ; such as alluvium, forming the rich and fertile soil in low lands ; diluvium consisting of rounded pebbles, sand and clay confusedly mixed together, by powerful currents of water in olden time, probably by the last great flood described in the scriptures. This formation, although highly interesting to the scientific geologist, is not considered a good soil by agriculturists, but is capable of being ameliorated by loam and manures. The fine white siliceous sand of Cape Cod belongs to this formation, and is useful in the manufacture of glass. The tertiary formation presents an abundance of potter's clay, arranged in regular layers, one above another, alternating with layers of sand. This formation is difficult to distinguish from the preceding, and is chiefly marked by its regular stratification, and by its fossil shells. It does not however resemble the formations of a similar name in Europe, on account of the absence of beds of calcareous marl, and abundance of shells which there occur. Professor Hitchcock does not consider this a good soil, although it is said to be congenial to rye and some other hardy plants.

New red sandstone is a rock occurring abundantly in the valley of the Connecticut, and on account of its ready disintegration, forms a soil which is said to be very good for the growth of rye, grass, fruit and forest trees.

Argillaceous slate and graywacke, when decomposed, form a good soil of a dark color, capable however of improvement. Bog iron ore, in low lands, produces a soil of deep red color, but its action on vegetation is unknown. Steatite, serpentine, scapolite rock, limestone, porphyry, quartz rock, chlorite, talcose, mica and hornblende slates, from the small quantity in which they occur, or the difficulty with which they yield to the usual causes of decomposition, are not supposed to contribute much to the formation of soil. Granite, sienite and gneiss, are said to produce good soils, although in Europe, the contrary opinion generally prevails. Greenstone, when decomposed, forms a warm and fertile soil.

The rocks and minerals which, from their nature and quantity are considered valuable, are granite, sienite, gneiss, greenstone, hornblende slate, porphyry of several kinds, quartz rock, mica and talcose slates, limestone, marble, serpentine, soapstone, graywacke, novaculite, red sandstone, porcelain clay, potter's clay, marl, peat and the Worcester coal (graphite.)

The ores of metals, are those of iron, lead, copper, zinc, manganese, and a little silver in lead ores. These constitute the valuable minerals of the state; and we refer the reader to the Report where he may learn the localities.

Professor Hitchcock closes his article upon economical geology, by relating some instances of idle and absurd researches for gold, silver and buried money, which illustrate the importance of a scientific geological survey of the country.

When we express our opinion of this part of the Report, we do no more than agree with the author in observing, that it calls for more ample details, which, however, it will require a longer time to collect, and which we hope will be hereafter added to the work. If this part of the Report should be thus enlarged, and contain a full description of all the localities where quarries and mines may be wrought, the methods to be pursued in working each particular mine or quarry, with plans of mines, furnaces, forges, processes for amending soils, manufacturing alum, copperas, blue vitriol, saltpetre, sea-salt, Epsom salts, sulphate of soda, &c., it would become the *vade mecuum* of practical workmen, and would greatly contribute to improve the arts and sciences.

Under the head of Topographical Geology, Professor Hitchcock describes some of the most charmingly picturesque scenery of the state, and aided by the skilful pencil of his lady, he has given us some very beautiful drawings in illustration of the subject. "Since," as he observes, "the contour of a country owes its peculiarities, in a great measure, to the character of the rocks found beneath the soil," it will be evident that such pictorial delineations are not misplaced in the geological description of the state.

> "The extended plain is considered alluvial or tertiary. The precipitous ridge or mountain, if dark colored, will indicate trap rocks; if light colored, granite; if the summit be rounded, and the aspect red or gray, it may be supposed to be made up of sandstone. The more extended and less precipitous mountain ranges, stretching away over many a league, correspond more nearly to the outlines of primary rocks.
>
> "Massachusetts is peculiarly mountainous. But mountain scenery is not particularly interesting, if the slopes are gentle and the outlines of the hills are much rounded. It needs the sharp towering peak, the overhanging cliffs, and the roaring torrent beneath, to arrest the attention and excite strong emotions. Such objects are numerous in this state, especially in the western part. Here, we find some scenery that is truly Alpine." — pp. 83, 94.

Professor Hitchcock thus expresses his emotions on looking down from the summit of Saddle Mountain, an eminence rising 2,800 feet above the valley at Adams, and 3,600 above the level of the sea.

> "I know of no place where the mind is so forcibly impressed by the idea of vastness, and even of immensity, as when the eye ranges abroad from this eminence. Towards the south, you have a view, more or less interrupted by spurs from the Taconic and Hoosic ranges of mountains, of that fertile valley which crosses the whole of Berkshire county. On the right and left you look down upon, or rather overlook the Taconic and Hoosic mountains, which from the valley beneath, seem of such towering height and grandeur. Beyond these mountains, on every side, you see the summits of peak beyond peak, till they are blended with the distant sky. The objects in the immediate vicinity of the mountain, do not forcibly arrest the attention; though from

the northern point of the summit, I should suppose the valley of Williamstown must be delightfully exhibited. Still, the vast depth of the valley around you, as you stand upon Greylock, contributes, no doubt, to swell the feeling of immensity and sublimity produced by looking abroad among such a sea of mountains." — p. 85.

The view which the author of the report enjoyed from the summit of Mount Tom, is so similar to one seen from the Rigi, that we lay it before the reader, as a miniature of a more magnificent spectacle, seen among the Swiss Alps.

"I obtained from this mountain, one summer morning, a striking view, while yet the whole valley of the Connecticut was enveloped in fog, and Tom, with a few other elevated peaks, connected with the greenstone range alone, rose above the vapor. The sun shining brightly, and the wind gently blowing, gave to this fog a strong resemblance to an agitated ocean. To the north and south, it seemed illimitable; but on the east and west, the high mountain ranges, that form the boundaries of the valley of the Connecticut, constituted its shores. I could not but feel transported back to that remote period, when this great valley was enveloped in like manner, by water, and Holyoke and Tom formed only low and picturesque islands upon its surface." — p. 91.

We agree, entirely, with the following remarks, of the Professor.

"What a pity it is, that so many of the most interesting mountains and hills in Massachusetts have got attached to them such uncouth and vulgar names! How must the poet's lines

———— 'scramble up and down,
On disproportioned legs, like Kangaroo,'

if such words as Saddle Mountain, Rattle Snake Hill, Bear Town Mountain, Mount Tom, Mount Toby, Sugar Loaf, Blue Mountain and Deerfield Mountain, be introduced. Holyoke, Taconic, Hoosic and Wachusett, are more tolerable; though most of them have an Indian origin. It would have been fortunate, if our forefathers had not attempted, in general, to supersede the aboriginal designations. For what mountain can ever become an object of much regard and attachment, if its beauties and sublimities cannot be introduced into a nation's poetry, without producing the most ridiculous associations!" — p. 93.

Fortunately, there are some summits in the state yet unnamed. It is to be hoped that men of taste, will see to it, that no further additions be made to the catalogue *of uncouth and barbarous* names.

The atlas of plates illustrating the Report, contains one general map, on which the rocks are represented by colors; one of the valley of the Connecticut; one indicating the general directions of strata; four sections of the rock formations, crossing the state in different directions; a tabular view of the rocks and minerals; nine views of scenery, together with four plates, representing organic remains of plants and animals found in the rocks; most of which drawings are due to the pencil of Mrs. Hitchcock. The colored map represents, with as much accuracy of detail as its size would permit, the great deposits of rocks and soils found in the state. The map of the valley of the Connecticut is uncolored, and displays with great fidelity its peculiarities. The map showing the directions of strata, is an outline sufficiently accurate to give a general idea of the subject. The sections are valuable additions to our knowledge of the relative positions of the rocks.

The tabular and systematic view of the rocks and minerals is so arranged as to show the different great formations and their imbedded minerals, with reference to the systems of Werner, Macculloch, Conybeare, De La Bêche, Brongniart and Lyell, and the natural division into stratified and unstratified rocks is adopted, while the series of rocks may be read off in either the ascending or descending order. This table is one of great value, as it removes all difficulties arising from any peculiar views which the author may entertain, and the student is at liberty to chose which ever he pleases of the general systems in the study of the rocks.

Mrs. Hitchcock's drawing of picturesque geological scenery, are equally acceptable to the geologist and the admirer of nature. The drawings of fossil remains present to the reader a view of the strange and wonderful organized beings that formerly inhabited the soil where we now live, and demonstrate to him the state of this part of the globe, at the time when such animals and plants flourished. The atlas presents to the eye the principal interesting points in the geology of the state, and is certainly a most valuable and useful accompaniment to the Report. We regret that neither time nor our limits will allow us to enter into an analysis of this portion of the work, and we refer the reader at once to its pictorial delineations.

Under the head of Scientific Geology, Professor Hitchcock describes the different groups of rocks which occur in the state, and endeavors to explain the theory of their formation and the analogies which they present to their supposed equivalents in Europe. He explains the manner in which he wishes the term rock to be understood, and uses this word in its most extended sense, as implying not only solid masses but also detritus, loose stones, sand, gravel, clay and soils.

The rocks are divided into stratified and unstratified; and are described in the descending order, beginning with the superficial soil or alluvium.

Stratified rocks, are those which are disposed in layers, having parallel and continuous seams. The upper part of the earth's crust consists chiefly of unconsolidated layers of sand, clay and gravel; and the lower down we examine the strata, the more dense and solid they become.

Alluvium is divided into several different kinds, such as that deposited by rivers, that washed up by the sea, and that of salt marshes.

Under this class are described several curious sub-marine forests situated in the waters near Cape Cod and Martha's Vineyard. It is suggested that others may be discovered along the south-eastern coast of the state, and perhaps along the whole Atlantic coast. As this subject has but recently attracted the attention of geologists, we hope that such persons as may enjoy the opportunity, will endeavor to bring to light more examples of submerged forest trees, and note particularly their depth below the tide waters.

Coasters and the officers of the Revenue Cutters, can render geology an important service by such observations, provided they will note down at the time, the facts they may observe, and send them to some public journal or newspaper. Examples of submerged forests are known in Europe, as they occur chiefly on the shores of England, and when a sufficient number of facts are collected, a general theory may be formed to account for them. At present, they cannot be satisfactorily accounted for.

Peat originates from accumulated and partially decayed plants, which collect in the bottoms of shallow lakes, and in the course of time fill the space formerly occupied by the water, rising to the surface; numerous sphagneous plants, mosses and ferns grow in it, and add their matter to swell the deposit. By this process a peat bog is ultimately formed, and proves valuable to the inhabitants of a country, as the wood is cut away and becomes scarce. It is capable of supplying, in a great measure, the want of coal in many districts, and is highly valuable for domestic use, and for fuel in manufactories. It is, therefore, a matter of congratulation, that this substance is found to exist in great profusion, in every part of our state. The causes which produce this substance are thought to be continually diminishing, but as many of the present peat bogs are yet too soft and wet to be advantageously explored, there will be a supply of this fuel for many ages, brought to an available condition by the gradual draining of swamps and ponds. Marl occurs in the bottom of ponds, and is generally found beneath the peat. The latter locality is not mentioned in the Report.

This substance consists of fine clay and carbonate of lime; and that found under peat is saturated with vegetable juices, so as to render it a very valuable manure for soils, particularly for those of a sandy nature, or those impregnated with sulphate of iron. We beg leave to call the attention of agriculturalists to this substance, since we have seen it render fertile many a barren tract of country. It is the carbonate of lime in the marl, that has the property of decomposing the sulphate of iron, removing a noxious ingredient, and replacing it by sulphate of lime or gypsum, a salutary stimulant to vegetation.

Professor Hitchcock observes, that marl is found in the bottoms of ponds in Berkshire county, and that it is continually deposited there by the water.

There are several other kinds of alluvium described in the Report, such as that of disintegration produced by decomposition of the rocks, and that of degradation or such as is produced by the washing down of the sides of hills and mountains.

The formation of bog iron ore is accounted for by the decomposition of iron pyrites, which forms sulphate of iron, and this substance decomposing again by the influence of the carbonic acid of the air, carbonate of iron is deposited in the lowlands where the sulphate had flowed in solution. Probably the action of the carbonate of lime and that of the alkalies of felspar may aid in the process, as does that of light and vegetable matter, providing a continual deposit in the meadows and ponds in the vicinity.

The action of the ice on bowlders is considered; and the encroachments of the sea in the formation of harbors explained;

as is also the gain of the land upon the sea in some places. In this part of the Report we perceive that the Professor did not find the sands of Cape Cod altogether barren. The excavation of valleys forms an interesting article, in which the Connecticut plays a conspicuous part; but the author does not think that river ever excavated its own bed, but that powerful causes, such as the elevation of strata and the mighty rush of diluvial waters with floods of ice, contributed to excavate the channel through which the river now winds its gentle course.

Diluvium. This deposit, the origin of which is assigned to the rush of waters which took place in the last great deluge, has fixed for a long time, the serious attention of the author of the Report; and his observations are of the deepest interest. He has devoted a few pages of his work to the history of this very remarkable deposit, and has published, in another work, a more full exposition of his views. Under the term Diluvium, Professor Hitchcock includes the layers of gravel, bowlders, sand and loam, which are spread over almost every part of the surface of the earth, and which has been confusedly mingled together by the action of powerful currents of water subsequent to the deposition of regular strata. He does not suppose that the last transient deluge could have produced and brought to its present situation all the diluvium which is spread over this continent.

> "It has," he observes, "obviously been the result of different agencies and of different epochs; the result of causes sometimes operating feebly and slowly, and at other times violently and powerfully.
>
> "But the conclusion to which he has been irresistibly forced, by an examination of this stratum in Massachusetts is, that *all the diluvium, which had been previously accumulated by various agencies, has been modified by a powerful deluge, sweeping from the north and north-west, over every part of the state; not excepting its highest mountains.*"—p. 148.

This position is ably maintained by examples in the topography of this deposit and the history of erratic bowlders.

It is an indisputable fact, noticed in various quarters of the globe, that large masses of rock have been transported to a considerable distance south of their original localities; thus the bowlders found around the city of St. Petersburg in Russia can be proved to have been derived from the mountains of Norway and Finland. In England, Germany, France, Canada, Nova Scotia and various parts of the United States, similar observations have been made by many geologists. Professor Hitchcock declares, that he was always able to trace the erratic bowlders of this state to a more northern locality whence they originated. He was led to notice this fact especially, as he began his survey of the southern part of the state and travelled through it, in consecutive parallels, in the same direction, and remarked that when he saw erratic stones, he always found the locality where they occurred, by proceeding northward; and the bowlders and blocks of stone became larger as he advanced towards their original locality. This fact is so well settled in geology, as to direct the traveller to the spot where the rock or mineral occurs, with a great degree of certainty of finding it in the direction from which according to theory it should be found.

There are some difficulties to be surmounted in conceiving how such enormous masses could have been transported to the distance through which they have evidently travelled. Various theories and hypotheses have been proposed; some, supposing the power that moved the rocks, to have been water in a liquid state, and others that it was ice forced onward by a terrible rush of water from the north arctic regions. Professor Hitchcock favors the latter hypothesis.

The second argument, brought forward by this gentleman to prove the direction of a powerful deluge, is, that there are grooves, scratches and furrows in the rocks, which appear to have been produced by friction of rocks, pebbles and water, which all coincide to prove that the current came from the north or north-west. Numerous localities are cited, to which the reader may refer. To prove that such a current prevailed on the most elevated of our mountains, he remarks, that the diluvial scratches may be seen on Wachusett, a mountain elevated three thousand feet above the sea. Professor Hitch cock concludes with this remark.

> " It would be easy to multiply examples of this kind of diluvial action. But the cases that have been described, occurring as they do in every part of the state, and frequently upon its highest mountains, seem sufficient to lead every reasonable man to the conclusion that these grooves and furrows were produced by the large bowlders, which now strew the surface, and exhibit in their rounded forms and smooth surfaces, the marks of powerful abrasion. And since we uniformly find these bowlders to the south and south-east of their parent rock, how can we doubt that a mighty current of

water has sometime or other swept over the surface from the north and north-west? It seems to me, that in regard to Massachusetts, the evidence of such a deluge is complete; and it is difficult to see how it could be more conclusive." — p. 170.

The facts that have been discovered tend to disprove the conjecture thrown out by Mons. L. Elie de Beaumont, in his Researches on some of the Revolutions of the surface of the Globe, that the last deluge might have been produced by the elevation of the Andes; for the diluvial wave evidently appears to have come from the north, which we cannot conceive to have been effected by such an event. We are aware that M. Beaumont only suggested this, as a possible explanation of the event, without attaching any importance to the conjecture. In the present state of our knowledge, it will be difficult, if not impossible, to assign a sufficient or probable cause of this grand cataclysm. May it not be that the sudden elevation of a chain of mountains would effect a change in the position of the earth's axis of rotation, and thus cause a tumultuous wave from the polar regions to rush over the land? Do not the remains of animals of warm climates found frozen in the ice and sand of Siberia and Kamscatka, with their flesh preserved, seem to indicate a sudden transition of temperature in those regions, such as might thus have been effected? More extensive researches may yet lead to such a conclusion, and we do not think it will be necessary to advance any hypothesis for any other purpose than to excite investigation.

Professor Hitchcock remarks, that he has no doubt that the mounds of the Western States, supposed by antiquarians to have been the work of man, are in reality diluvial or tertiary deposits, and not the work of mortals, but of God.

The organic remains found in diluvium are few and uninteresting, mostly belonging to recent species of shell-fish.

Tertiary formations are described in the Report under two divisions.

The most recent tertiary, and the plastic clay formations; —

"These are distinguished from each other by their mineralogical characters, their organic remains, and the different position of their strata." — p. 178.

The most recent tertiary is found to constitute extensive beds in the valley of the Connecticut; and a few patches are described as occurring at Cambridge and Charlestown. This formation is said to exist in horizontal strata, and is, in this state, remarkably free from organic remains. It consists of alternating layers of white sand and clay, and its upper surface bears marks of disturbance from diluvial action; while the beds of clay themselves, appear to have been disturbed, in some places, during their deposition, as is proved by contortions which the strata exhibit. In this deposit are found extensive beds of brown oxide of iron; hæmatite and nodular, argillaceous, iron ore.

Organic remains rarely occur, but Professor Hitchcock thinks he has found ovulites and scyphæ. The fossil, figured as the ovulite, is similar to species found in the clay at Bangor, Maine. Those found at the latter place are more cylindrical, and resemble in form the belemite; but they have, in other respects, a close resemblance to the fossil figured by Professor Hitchcock.

The plaster clay formation is described as occurring at Gay Head, Martha's Vineyard and at Nantucket. This formation is characterized by its variegated clays, layers of sand, gravel, iron ore and lignite; and contains numerous and very remarkable organic remains, such as impressions of leaves of plants, Carpolites, shark's teeth of gigantic size, indicating that they must have belonged to an animal at least thirty-six feet in length. Teeth of crocodiles and bones of enormous Saurian reptiles, probably those of the Plesiosaurus.

In the green sand at Gay Head, he found also remains of Crustaceous animals, such as crabs, which are much broken, shewing that they were deposited before the green sand had become stationary. Zoophytes were found in this same deposit, as were also several species of shells, such as the venus tellina and a turbo.

The author of the Report refers this tertiary formation to its equivalent, the plastic clay of Europe, and remarks that,

> "The variegated clays, the interstratified lignites with amber, and the intermixture of marine animals with terrestrial vegetable remains, must settle the question." — pp. 201, 202.

The plastic clay formation is also found in Duxbury, containing many fossil shells similar to those found at Gay Head.

The new red sandstone formation occurs, forming extensive beds in the valley of the Connecticut river, stretching from New Haven, Connecticut, to the north line of Massachusetts in Northfield. This formation is usually the depository of gypsum and rock salt, and in Europe, overlie the coal measures. It does not appear from Professor Hitchcock's examination to contain any considerable quantities of these valuable minerals in this state. He found it to contain many curious fossil relics, among others, impressions of fossil fish belonging to the genus *Paleothrissum*, exactly like those which are found in the state of Mansfield and Hesse in Germany; and the skeleton of a vertebral animal, several feet long, which was dug up at East Windsor, Connecticut, eighteen feet below the surface.

Ores of copper in this formation in Connecticut are found at Granby, and near the junctions of this rock with the greenstone trap rocks. Ores of lead, zinc, and iron, are found in a similar situation.

Among the fossil vegetables found in this formation are *Calamites*, *Lycopodites*, *Fucoides*, and the fossil trunk of a tree.

Zoophytes, of a remarkable character, were also discovered in the shale or fine micaceous sandstone forming the banks of Westfield river. Among them are enormous *Gorgoniæ* or sea fans, are of a magnitude surpassing the most gigantic species of the tropical seas. One of these remarkable fossils he has traced for more than eighteen feet in length and probably ten feet in width! *Radiaria* of several species are found in the fœtid limestone at West Springfield.

All the facts that have been discovered by the author of the Report, in the valley of the Connecticut, tend to prove, that the sandstone of that valley once formed the bottom of at tropical sea, in which flourished the various animals now found imbedded in the rocks; while those portions of the soil above the level of the water, produced those remarkable plants, which are now found petrified.

> "It is certainly an interesting thought, that this delightful valley, which now forms so charming a residence for man, once constituted, for an immense period, the bottom of a tropical ocean, where gigantic Gorgoniæ, certainly twenty, and perhaps forty feet high, formed coral groves, and Fucoideæ more numerous, flourished.
>
> "The astonishing change brought about in the course of ages, exalts our conceptions of the wisdom and extent of the plans of the Deity; and leads us to anticipate future changes, whenever those plans may require."—p. 246.

Since the publication of the Report, Professor Hitchcock has made some remarkable discoveries in the new red sandstone formation of the Connecticut valley, which we think it proper to notice in this place. We allude to his account of the *ornithichnites* or *foot marks of birds*, which he has discovered in this rock, concerning which he has published an able and very interesting memoir in the American Journal of Science, Vol. xxix, No 2.

His attention was first called to this subject by Dr. James Deane of Greenfield, who sent him some casts of impressions on red, micaceous sandstone, brought from the south part of Montague, for flagging stones. The original impressions were presented by Dr. Deane to Amherst college, where they may be seen.

Professor Hitchcock afterwards saw some impressions of a similar kind in Deerfield, and learning that the stone came from Gill, he proceeded thither, and discovered a number of very large and distinct impressions in a quarry, near the *Horse Race* of Connecticut river. Several fine examples of similar kind were also found at South Hadley near Mount Holyoke.

The species of ornithichnites are divided into two orders 1st. *Pachydactyli* or thick toed birds. 2d. *Leptodactyli* or slender-toed birds.

The *O. giganteus*, is a bird track which measures sixteen or seventeen inches in length; while the distance of the steps from each other is from four to six feet! Several rows of tracks were found, side by side, rendering it probable, according to the Professor, that the birds were gregarious.

The foot marks called *O. ingens* are still more remarkable on account of their great size and the impressions of a hairy appendage upon the heel. He remarks,

> "I have been led to suspect that the bird possessed a sort of knobbed heel, covered with wiry feathers, which sunk into the mud when the track was deep. Yet I do not feel very confident as to the nature of this appendage. The impression of the bristles extends backwards from the heel, at least eight or nine inches; so that the whole length of the track is not less than *two feet!* The length ef the step appears to have been about six feet; although I have had few opportunities to ascertain this fact.
>
> "Indeed I hesitate not to say, that the impression made on the

mud appears almost as deep, indicating a pressure almost as great as if an elephant had passed over it. I could not persuade myself, until the evidence became perfectly irresistible, that I was examining merely the track of a bird."—p. 15.

From the number of toes indicated by these tracks, he thinks the birds must have been a species of grallæ. The tracks are much larger than those of any ostrich, and are different in respect to the number and divisions of the toes. The skeleton of an ostrich in the museum of the Boston Society of Natural History has a foot, the greatest length of which is eleven and a quarter inches, while its legs are three feet seven inches long, and were perhaps four feet in length when the animal was clothed with flesh. Its toes are two in number, and very different from the drawings in the paper which we are noticing. The length of the animal from the extremity of the body to the head is six feet; and it could have raised its head upwards of nine feet from the ground. How greatly must the birds whose footsteps are described by Professor Hitchcock, have surpassed in size the African ostrich, when its feet were nearly two feet in length, and its stride upward of six feet. Professor Hitchcock does not doubt that these giant shore birds were twice as large as the largest of the ostrich tribe, and that they were the inhabitants of a hot climate, which existed at the period, when these enormous birds stalked along the shores of a tropical sea, which is supposed to have washed the valley of the Connecticut in olden times.

In corroboration of his views he cites the occurrence of corals, enormous Gorgoniæ, and other organic relics, which must have grown in a tropical sea, but which are now found in the solid rocks forming the embankments of the Connecticut river.

Professor Hitchcock has made plaster casts of all the most interesting of the bird tracks, and will send a suite of them to the Museum of the Boston Society of Natural History. He also offers to exchange similar casts for fossils from other parts of the country. We beg leave to refer the reader to the original memoir in the American Journal of Science.

The graywacke formation is described in the Report as including several kinds of rock, varying from a fine argillaceous slate to the coarsest conglomerate and brecci. It is usually considered as belonging to the transition series, a class which

Professor Hitchcock does not adopt. This rock formation, which covers a great area of country, extending from Rhode Island to Boston, is one of the most interesting class, since it is the depository of anthracite coal, and contains many curious fossils belonging to that formation. The coal mines of Rhode Island are included in it, and the accompanying shales and wacke are filled with impressions of fossil plants, such as must have grown on the spot where they are found, and yet in a tropical climate. Since the Report was published, we have had the satisfaction of identifying a similar coal field within the limits of our state, where several narrow beds of anthracite of good quality have been found, indicating the probability of finding others of sufficient magnitude to be advantageously explored. Several species of Pecopteris and Neuopteris were found, and the trunk of a Cactus, besides numerous petrifactions, apparently belonging to the genus Calamite or Equisetum. The conglomerate rocks, such as may be seen at Roxbury, and extending from thence to Rhode Island, are composed of a very firm argillaceous cement, which is sometimes changed into a sort of compact felspar, and pebbles of various size, are agglutinated by this substance. These pebbles bear evidence of having been rounded by attrition, doubtless by the action of the sea, while the paste in which they are imbedded, was probably derived from their friction against each other, and the mud and sand of the shore of the former ocean. The most remarkable appearances are to be seen in these rock-pebbles, broken asunder as if cut with a sharp instrument, and their divided portions occupying different sides of a fissure. Dykes of greenstone trap have also been injected into and through it, effecting some curious changes in the rock when the dyke was of sufficient magnitude.

Every appearance observed in this rock goes to prove that it has been elevated by subterraneous causes from the sea, while the elevating rock was in an incandescent state, and acted powerfully upon the superincumbent rock. Those portions of the conglomerate which were powerfully heated, would of course lose the organic remains that might have been imbedded in them, and the paste would assume the compact appearance which it now presents.

By the agency of heat and of the elevating power, we are enabled to account for the fracture of the pebbles in their centres, and for every other phenomenon this rock exhibits in our vicinity. No one who examines the relative position of the greenstone trap and of this rock, can for a moment doubt that the former rock was the efficient agent in the disturbance of the strata. Among the changes, which the minerals included in this rock have undergone, may be noticed the conversion of anthracite into graphite in some places, as in Rhode Island; and perhaps we may be justified in the opinion, that the high temperature and pressure of the rocks when elevated, determined the formation of anthracite instead of bituminous coal.

The next series of rocks described in the Report is the clay slate, respecting which Professor Hitchcock is in doubt whether or not it can be referred to the graywacke group. It is certain that it belongs to the lowest of the transition series, as it passes by imperceptible shades into micaceous slate. It is this rock at Lancaster, which includes those remarkable crystallizations of andalusite that have been called chiastolite or macle, and which are certain to arrest the eye of the curious traveller who passes through that village, on account of their fantastic shapes, and the striking contrast which they exhibit to the dark rock forming their matrix.

The limestone rocks which occur in various parts of the state, but chiefly in Berkshire county, are described, and one deposit of encrinal limestone, existing at Bernardston, with fossils which were not noticed in the first edition of the Report. This limestone is said to contain imbedded ores of iron.

The limestones of Berkshire furnish several handsome marbles, which will doubtless become more valuable in commerce, when means of transporting them by rail roads shall be supplied.

Bolton, Boxboro' and Littleton have beds of limestone included in gneiss, which are worked for lime. At these localities occur many rare and beautiful minerals, which are eagerly sought for by mineralogists.

Scapolite rocks occur in abundance in the vicinity of the limestone beds. This rock is not, however, of any use in the arts.

Quartz rock exists in various parts of the state, and in some places is used in the manufacture of glass.

Mica slate, essentially composed of Quartz and mica, exists frequently in connexion with the gneiss rocks. It contains a variety of crystallized minerals, and occupies several large tracts in the state.

Talcose slate is found in the midst of the mica slate of the Hoosic mountain range, and in various parts of the state. Its most important included minerals are ores of iron, of which the micaceous specular ore of Hawley is an example. Where this formation appears in Vermont, small quantities of gold have been found in quartz, associated with iron ore.

Hornblende slate and gneiss terminate the series of stratified rocks. The latter rock is used for buildings and for flagging stones, for which purposes it is well adapted. Its localities are so numerous that it will be unnecessary to quote them, since it is the most abundant rock in the state. It differs from granite only in its stratified disposition, and is closely connected with that rock.

Professor Hitchcock enters at length upon the discussion of the theory of its formation, which he thinks to have been affected by the heat of nether rocks which were elevated in contact with it. We refer the reader to the work for the details.

Unstratified rocks are regarded as having generally been produced by subterranean causes, and erupted to the surface by igneous agency. Greenstone is one of the most remarkable of this class, and generally bears with it internal evidence of its Plutonic origin. We refer our readers to Mount Holyoke and numerous localities in the vicinity of Boston for examples. Various simple minerals are found in this rock, some of which are probably the products of fire, while others were produced by subsequent infiltration. In a variety of amygdaloidal greenstone at Deerfield, Professor Hitchcock found a new mineral allied to Heulandite which he has named Lincolnite in honor of his patron the ex-governor.

Porphyry occurs in numerous parts of the state, and is especially abundant at Malden, Medford and Lynn.

Sienite, a rock consisting of mingled crystals of felspar, quartz and hornblende, is the rock now generally used in Boston and its vicinity for building stone, and its beauty and durability have caused it to be sought for architectural purposes in the cities of the middle and southern states; so that the Quincy quarry has become extremely valuable to commerce. Sienite is regarded by Professor Hitchcock as merely a modification of granite, into which it frequently passes by regular gradations, while it also appears to unite with greenstone in a similar manner. Like granite it is evidently a rock of sudden crystallization from igneous fluidity, as is proved, not only by its structure and composition, but by its action on other rocks. It forms a belt surrounding the environs of Boston, and extending from Quincy to Cape Ann, and is in contact with a great variety of overlying and subordinate rocks. Professor Hitchcock is of opinion that sienite has resulted from the fusion of stratified rocks.

Granite, as we have remarked, is the lowest rock to which man has ever penetrated, while it also peers out from the summits of the most lofty mountains, and appears to form the solid basis of the earth. It consists of quartz, felspar and mica in aggregate crystals, the relative proportions and arrangement of which is extremely variable, and the varieties thus produced are known by different distinctive appellations such as porphyritic granite, graphic granite, &c.

This rock exists in abundance in the state, in scattered bowlders, erratic blocks, and forms a continuous mass from Andover to Rhode Island. It also exists in Worcester county, forming numerous veins in gneiss and other rocks. It occurs also in mountain masses at Fitchburg, Westford and Lowell. The veins of granite, which intersect the superincumbent rocks, irrefragably prove the former rock to have been injected through the latter from below. Professer Hitchcock has given a number of wood cuts in his report, to illustrate this subject, shewing its intrusion into stratified rocks, such as mica and hornblende slates, gneiss and limestone, from which it may be fairly inferred that the granite was thrown up from below, effecting disruption of the superincumbent strata. Facts which have been collected in Europe, go to prove the same result, and the extreme antiquity of the origin and elevation of granite, seems to be now very doubtful, for it has been satisfactorily proved to have been elevated in numerous places, since the deposition of the secondary rocks. Granite is the rich repository of various valuable and brilliant minerals; ores of lead, copper and iron are of frequent occurrence, and Professor Hitchcock has found a crystal of oxyd of tin in this rock in Massachusetts, an ore that abounds in this rock in England.

Professor Hitchcock infers the igneous origin of Granite,

"1*st. From the inclined position of the stratified rocks.* 2*d. From the manner in which it is intruded among the stratified rocks.* 3*d. From the mechanical effects which it appears to have exerted upon the stratified rocks in its immediate vicinity.* 4*th.*

From its chemical effects upon the surrounding strata. 5th. From its crystalline structure, and the numerous crystallizations of other substances that have taken place in it."

The Report concludes with the application of the theory of central heat, and Elie De Beaumont's theory of the elevation of mountains, in which the Professor endeavors to refer some of our mountain chains to the systems of the French Geologist, and in which he appears to have made some progress, although it will be necessary to make further researches before this arrangement can be depended upon.

The fourth and last divisions of the Report contains extensive and valuable catalogues of animals and plants which have been found in the state, at the end of which, is the following general summary.

		No. of genera.	No. of species.
I.	Mammalia,	26	45
II.	Birds,	70	157
III.	Reptiles,	7	34
IV.	Fishes,	57	108
V.	Shells,	76	169
VI.	Crustacea,	26	38
VII.	Spiders,	21	125
VIII.	Insects,	501	2350
IX.	Radiata,	18	27
	Total of animals,	802	3153
X.	Plants, *(flowering,)*	454	1246
	" *(flowerless,)*	140	491
	Total of Plants,	594	1737

The catalogues have been chiefly furnished by gentlemen cultivating the several departments of Natural History, and no doubt the number of species of animals and plants found in the state will be still much augmented by additional discoveries which are continually in progress. We have been compelled by the vast number of facts contained in the Report, and by our limits in this notice, to pass over, in a cursory manner, many interesting subjects, which are discussed in it, and which we must invite the reader to study in detail at the source whence we have already so largely drawn. We feel confident that many an otherwise weary journey may be made delightful, if the traveller would take the Report on the Geology of the state with him, and observe the curious phenomena which it describes, and we are sure he would return to his home a wiser and better man for this exercise of his faculties.

We cannot close this imperfect notice of Professor Hitchcock's great work, without referring the reader to some very interesting memoirs, which this author has published in the Biblical Repository for 1835, on "the Connexion between Geology and Natural Religion," and on "the Connexion between Geology and the Mosaic History of the Creation." These articles, in a literary and scientific point of view, are to be classed among the happiest efforts of the author, and cannot fail to be read with delight by every man of intelligence.

ART. VI.—*History of Concord.*

1. *A History of the Town of Concord, from its earliest Settlement, to* 1832 *; and of the adjoining Towns, Bedford, Acton, Lincoln and Carlisle ; containing various Notices of County and State History, not before published.* By LEMUEL SHATTUCK, Member of the Massachusetts Historical Society. Boston. Russell, Odiorne & Co. 1835. 8vo. pp. 400.
2. *An Historical Discourse, delivered before the Citizens of Concord,* 12*th September,* 1835, *on the Anniversary of the Incorporation of the Town.* By RALPH WALDO EMERSON. Published by request. Concord. 1835. 8vo. pp. 52.

THE author of this long-expected History has done well, in the outset, to commend his work to the respect of the public, by proving, in his Preface, that he appreciates the value of accurate annals of a town. The qualification may seem quite indispensable to one who undertakes to record them, whether for the benefit of the district described, in particular, or of the world at large. It may seem quite easy also of attainment; so much so as to make the lack of it considerably more remarkable than the possession. Yet, how rarely do we meet with it. How few are the works of this class which may be depended on even for their accuracy; and we are speaking now of their value in that regard alone. We say nothing of the virtue of completeness in detail, or of comprehensiveness in design. We pass over the matter of judgment and tact in